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Trying 01081...Open

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TERMINAL (ENTER 1, 2, 3, 4, OR ?): 3

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FILE 'USPAT' ENTERED AT 17:28:40 ON 11 AUG 1999
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=> file uspat epo jpo; \s animat? (p) (light (w) source?)

FILE 'USPAT' ENTERED AT 17:29:29 ON 11 AUG 1999

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FILE 'JPO' ENTERED AT 17:29:29 ON 11 AUG 1999

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 *    J A P A N E S E   P A T E N T   A B S T R A C T S            *
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'\S' IS NOT A RECOGNIZED COMMAND

=> s animat? (p) (light (w) source?)

FILE 'USPAT'
          5998 ANIMAT?
        680669 LIGHT
        824483 SOURCE?
L1         123 ANIMAT? (P) (LIGHT (W) SOURCE?)

FILE 'EPO'
          1246 ANIMAT?
        137882 LIGHT
        139646 SOURCE?
L2          36 ANIMAT? (P) (LIGHT (W) SOURCE?)

FILE 'JPO'
          1879 ANIMAT?
        395301 LIGHT
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        326656 SOURCE?
L3          11 ANIMAT? (P) (LIGHT (W) SOURCE?)

TOTAL FOR ALL FILES
L4         170 ANIMAT? (P) (LIGHT (W) SOURCE?)

=> d l1 1-123 fd


US PAT NO:     5,921,674 [IMAGE AVAILABLE]             L1: 1 of 123
DATE FILED:    Mar. 19, 1997

US PAT NO:     5,900,850 [IMAGE AVAILABLE]             L1: 2 of 123
DATE FILED:    Aug. 28, 1996

US PAT NO:     5,896,230 [IMAGE AVAILABLE]             L1: 3 of 123
DATE FILED:    Sep. 9, 1997

US PAT NO:     5,870,220 [IMAGE AVAILABLE]             L1: 4 of 123
DATE FILED:    Jul. 12, 1996

US PAT NO:     5,870,097 [IMAGE AVAILABLE]             L1: 5 of 123
DATE FILED:    Jun. 27, 1996

US PAT NO:     5,863,109 [IMAGE AVAILABLE]             L1: 6 of 123
DATE FILED:    Dec. 17, 1996

US PAT NO:     5,846,086 [IMAGE AVAILABLE]             L1: 7 of 123
DATE FILED:    Feb. 13, 1996

US PAT NO:     5,841,585 [IMAGE AVAILABLE]             L1: 8 of 123
DATE FILED:    May 8, 1996

US PAT NO:     5,818,627 [IMAGE AVAILABLE]             L1: 9 of 123
DATE FILED:    Jan. 24, 1997

US PAT NO:     5,801,812 [IMAGE AVAILABLE]             L1: 10 of 123
DATE FILED:    Apr. 10, 1997

US PAT NO:     5,796,376 [IMAGE AVAILABLE]             L1: 11 of 123
DATE FILED:    Apr. 14, 1995

US PAT NO:     5,793,470 [IMAGE AVAILABLE]             L1: 12 of 123
DATE FILED:    May 22, 1995

US PAT NO:     5,782,762 [IMAGE AVAILABLE]             L1: 13 of 123
DATE FILED:    Oct. 27, 1994

US PAT NO:     5,767,857 [IMAGE AVAILABLE]             L1: 14 of 123
DATE FILED:    Aug. 30, 1996

US PAT NO:     5,760,874 [IMAGE AVAILABLE]             L1: 15 of 123
DATE FILED:    Jan. 21, 1997

US PAT NO:     5,754,147 [IMAGE AVAILABLE]             L1: 16 of 123
DATE FILED:    Oct. 26, 1995

US PAT NO:     5,749,646 [IMAGE AVAILABLE]             L1: 17 of 123
DATE FILED:    Dec. 15, 1994
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Trying 11180...Open

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FILE 'USPAT' ENTERED AT 16:42:40 ON 11 AUG 1999
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=> file uspat epo jpo; s (approximat? or estimat?) (p) illuminat? (p) (finite
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FILE 'USPAT' ENTERED AT 17:04:53 ON 11 AUG 1999
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FILE 'USPAT'
        898025 APPROXIMAT?
        111371 ESTIMAT?
        117930 ILLUMINAT?
         45338 FINITE
        680669 LIGHT
        824483 SOURCE?
L1           0 (APPROXIMAT? OR ESTIMAT?) (P) ILLUMINAT? (P) (FINITE (W) LI
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FILE 'EPO'
         46212 APPROXIMAT?
          7336 ESTIMAT?
         24455 ILLUMINAT?
          2172 FINITE
        137882 LIGHT
        139646 SOURCE?
L2           0 (APPROXIMAT? OR ESTIMAT?) (P) ILLUMINAT? (P) (FINITE (W) LI
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FILE 'JPO'
         74925 APPROXIMAT?
         26631 ESTIMAT?
         29891 ILLUMINAT?
          1587 FINITE
        395301 LIGHT
        326656 SOURCE?
L3           0 (APPROXIMAT? OR ESTIMAT?) (P) ILLUMINAT? (P) (FINITE (W) LI
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TOTAL FOR ALL FILES
L4           0 (APPROXIMAT? OR ESTIMAT?) (P) ILLUMINAT? (P) (FINITE (W) LI
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=> s (finite (w) light (w) source?) and (animation or (computer (w) graphic?))

FILE 'USPAT'
         45338 FINITE
        680669 LIGHT
        824483 SOURCE?
            22 FINITE (W) LIGHT (W) SOURCE?
          3252 ANIMATION
        237799 COMPUTER
        123717 GRAPHIC?
          4753 COMPUTER (W) GRAPHIC?
L5           0 (FINITE (W) LIGHT (W) SOURCE?) AND (ANIMATION OR (COMPUTER
(W)
                GRAPHIC?))

FILE 'EPO'
          2172 FINITE
        137882 LIGHT
        139646 SOURCE?
             2 FINITE (W) LIGHT (W) SOURCE?
           502 ANIMATION
         46117 COMPUTER
          9037 GRAPHIC?
           516 COMPUTER (W) GRAPHIC?
L6           0 (FINITE (W) LIGHT (W) SOURCE?) AND (ANIMATION OR (COMPUTER
(W)
                GRAPHIC?))

FILE 'JPO'
          1587 FINITE
        395301 LIGHT
        326656 SOURCE?
             0 FINITE (W) LIGHT (W) SOURCE?
          1717 ANIMATION
         84254 COMPUTER
         18856 GRAPHIC?
           513 COMPUTER (W) GRAPHIC?
L7           0 (FINITE (W) LIGHT (W) SOURCE?) AND (ANIMATION OR (COMPUTER
(W)
                GRAPHIC?))

TOTAL FOR ALL FILES
L8           0 (FINITE (W) LIGHT (W) SOURCE?) AND (ANIMATION OR (COMPUTER
(W)
                GRAPHIC?))
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FILE 'USPAT' ENTERED AT 17:10:56 ON 11 AUG 1999
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*         U. S.   P A T E N T   T E X T   F I L E                  *
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=> e prater, m/in

E#	FILE	FREQUENCY		TERM
E1	USPAT	1		PRATER, LARRY P/IN
E2	USPAT	1		PRATER, LARRY PAUL/IN
E3	USPAT	0	-->	PRATER, M/IN
E4	USPAT	1		PRATER, MARTIN/IN
E5	USPAT	1		PRATER, MICHAEL A/IN
E6	USPAT	1		PRATER, MICHAEL E/IN
E7	USPAT	1		PRATER, MITCH/IN
E8	USPAT	1		PRATER, PAUL L/IN
E9	USPAT	1		PRATER, PERRY/IN
E10	USPAT	1		PRATER, RAYMOND/IN
E11	USPAT	1		PRATER, ROBERT F/IN
E12	USPAT	1		PRATER, ROBERT W/IN

=> s e7

L1 1 "PRATER, MITCH"/IN

=> d l1 ccls fd ab

US PAT NO: 5,867,169 [IMAGE AVAILABLE] L1: 1 of 1
US-CL-CURRENT: 345/431, 150; 358/520; 382/167
DATE FILED: Apr. 17, 1996

ABSTRACT:
A method for manipulating color values in a computer graphics system. Colors are mapped into a color space referred to as "HSY space," which provides independent control over the orthogonal parameters of hue, saturation and luminance. The intuitive color description qualities of hue and saturation are retained in combination with the luminance parameter, which is specifically tuned to the response of the human eye and a specific display system. The present invention thus provides ease of use for the graphic artist without the hue and saturation dependent luminance response of prior art methods. Color image data in HSY format is manipulated by a color graphics editing or rendering process by altering hue, saturation and luminance individually. The graphic artist is thus able to select the appropriate color by using tints, shades and tones. In one embodiment, HSY color data is converted into a second color data format, such as RGB, for display or storage purposes to meet the physical requirements of display devices. A reverse transformation is used to convert scanned image data in RGB format into HSY data for manipulation in HSY space by the editing process. In addition, two hue preserving transformations are described which map the unit HSY color space into the unit RGB color space.

POVRAY

4.6.5 The Area Light Source

So far all of our light sources have one thing in common. They produce sharp shadows. This is because the actual light source is a point that is infinitely small. Objects are either in direct sight of the light, in which case they are fully illuminated, or they are not, in which case they are fully shaded. In real life, this kind of stark light and shadow situation exists only in outer space where the direct light of the sun pierces the total blackness of space. But here on Earth, light bends around objects, bounces off objects, and usually the source has some dimension, meaning that it can be partially hidden from sight (shadows are not sharp anymore). They have what is known as an umbra, or an area of fuzziness where there is neither total light or shade. In order to simulate these soft shadows, a ray-tracer must give its light sources dimension. POV-Ray accomplishes this with a feature known as an area light.

Area lights have dimension in two axis'. These are specified by the first two vectors in the area light syntax. We must also specify how many lights are to be in the array. More will give us cleaner soft shadows but will take longer to render. Usually a 3*3 or a 5*5 array will suffice. We also have the option of specifying an adaptive value. The adaptive keyword tells the ray-tracer that it can adapt to the situation and send only the needed rays to determine the value of the pixel. If adaptive is not used, a separate ray will be sent for every light in the area light. This can really slow things down. The higher the adaptive value the cleaner the umbra will be but the longer the trace will take. Usually an adaptive value of 1 is sufficient. Finally, we probably should use the jitter keyword. This tells the ray-tracer to slightly move the position of each light in the area light so that the shadows appear truly soft instead of giving us an umbra consisting of closely banded shadows.

OK, let's try one. We comment out the cylinder lights and add the following:

```
light_source {
  <2, 10, -3>
  color White
  area_light <5, 0, 0>, <0, 0, 5>, 5, 5
  adaptive 1
  jitter
}
```

This is a white area light centered at <2,10,-3>. It is 5 units (along the x-axis) by 5 units (along the z-axis) in size and has 25 (5*5) lights in it. We have specified adaptive 1 and jitter. We render this at 200x150 -A.

Right away we notice two things. The trace takes quite a bit longer than it did with a point or a spotlight and the shadows are no longer sharp! They all have nice soft umbrae around them. Wait, it gets better.

Spotlights and cylinder lights can be area lights too! Remember those sharp shadows from the spotlights in our scene? It would not make much sense to use a 5*5 array for a spotlight, but a smaller array might do a good job of giving us just the right amount of umbra for a spotlight. Let's try it. We comment out the area light and change the cylinder lights so that they read as follows:

```
light_source {
  <2, 10, -3>
  color White
  spotlight
  radius 15
  falloff 18
  tightness 10
  area_light <1, 0, 0>, <0, 0, 1>, 2, 2
  adaptive 1
  jitter
```

```
  point_at <0, 0, 0>
 }

 light_source {
  <10, 10, -1>
  color Red
  spotlight
  radius 12
  falloff 14
  tightness 10
  area_light <1, 0, 0>, <0, 0, 1>, 2, 2
  adaptive 1
  jitter
  point_at <2, 0, 0>
 }

 light_source {
  <-12, 10, -1>
  color Blue
  spotlight
  radius 12
  falloff 14
  tightness 10
  area_light <1, 0, 0>, <0, 0, 1>, 2, 2
  adaptive 1
  jitter
  point_at <-2, 0, 0>
 }
```

We now have three area-spotlights, one unit square consisting of an array of four (2*2) lights, three different colors, all shining on our scene. We render this at 200x150 -A. It appears to work perfectly. All our shadows have small, tight umbrae, just the sort we would expect to find on an object under a real spotlight.

4.6.6 Assigning an Object to a Light Source

Light sources are invisible. They are just a location where the light appears to be coming from. They have no true size or shape. If we want our light source to be a visible shape, we can use the looks_like keyword. We can specify that our light source can look like any object we choose. When we use looks_like, no_shadow is applied to the object automatically. This is done so that the object will not block any illumination from the light source. If we want some blocking to occur (as in a lampshade), it is better to simply use a union to do the same thing. Let's add such an object to our scene. Here is a light bulb we have made just for this purpose:

```
 #declare Lightbulb = union {
  merge {
   sphere { <0,0,0>,1 }
   cylinder { <0,0,1>, <0,0,0>, 1
    scale <0.35, 0.35, 1.0>
    translate  0.5*z
   }
   texture {
    pigment {color rgb <1, 1, 1>}
    finish {ambient .8 diffuse .6}
   }
```

```
  }
  cylinder { <0,0,1>, <0,0,0>, 1
    scale <0.4, 0.4, 0.5>
    texture { Brass_Texture }
    translate  1.5*z
  }
  rotate -90*x
  scale .5
}
```

Now we add the light source:

```
light_source {
  <0, 2, 0>
  color White
  looks_like { Lightbulb }
}
```

Rendering this we see that a fairly believable light bulb now illuminates the scene. However, if we do not specify a high ambient value, the light bulb is not lit by the light source. On the plus side, all of the shadows fall away from the light bulb, just as they would in a real situation. The shadows are sharp, so let's make our bulb an area light:

```
light_source {
  <0, 2, 0>
  color White
  area_light <1, 0, 0>, <0, 1, 0>, 2, 2
  adaptive 1
  jitter
  looks_like { Lightbulb }
}
```

We note that we have placed this area light in the x-y-plane instead of the x-z-plane. We also note that the actual appearance of the light bulb is not affected in any way by the light source. The bulb must be illuminated by some other light source or by, as in this case, a high ambient value. More interesting results might therefore be obtained in this case by using halos (see section "Halos").

Appendix A Copyright

The following sections contain the legal information and license for the Persistence of Vision(tm) Ray-Tracer, also called POV-Ray(tm).

Before you use this program you have to read the sections below.

Appendix A.1 General License Agreement

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4.6.2 The Pointlight Source

Pointlights are exactly what the name indicates. A pointlight has no size, is invisible and illuminates everything in the scene equally no matter how far away from the light source it may be (this behavior can be changed). This is the simplest and most basic light source. There are only two important parameters, location and color. Let's design a simple scene and place a pointlight source in it.

We create a new file and name it litedemo.pov. We edit it as follows:

```
#include "colors.inc"
#include "textures.inc"

camera {
 location <-4, 3, -9>
 look_at  <0, 0, 0>
 angle 48
}
```

We add the following simple objects:

```
plane { y, -1
 texture {
  pigment {
   checker
   color rgb<0.5, 0, 0>
   color rgb<0, 0.5, 0.5>
  }
  finish {
   diffuse 0.4
   ambient 0.2
   phong 1
   phong_size 100
   reflection 0.25
  }
 }
}

torus { 1.5, 0.5
 texture { Brown_Agate }
 rotate <90, 160, 0>
 translate <-1, 1, 3>
}

box { <-1, -1, -1>, <1, 1, 1>
 texture { DMFLightOak }
 translate <2, 0, 2.3>
}

cone { <0,1,0>, 0, <0,0,0>, 1
 texture { PinkAlabaster }
 scale <1, 3, 1>
 translate <-2, -1, -1>
}
```

```
sphere { <0,0,0>,1
  texture { Sapphire_Agate }
  translate <1.5, 0, -2>
}
```

Now we add a pointlight:

```
light_source {
  <2, 10, -3>
  color White
}
```

We render this at 200x150 -A and see that the objects are clearly visible with sharp shadows. The sides of curved objects nearest the light source are brightest in color with the areas that are facing away from the light source being darkest. We also note that the checkered plane is illuminated evenly all the way to the horizon. This allows us to see the plane, but it is not very realistic.

Appendix F.2 Scene Debugging Tips

To see a quick version of your picture, render it very small. With fewer pixels to calculate the ray-tracer can finish more quickly. -W160 -H
100 is a good size.

Use the +Q quality switch when appropriate.

If there is a particular area of your picture that you need to see in high resolution, perhaps with anti-aliasing on (perhaps a fine-grained wood texture), use the +SC, +EC, +SR and +ER switches to isolate a window.

If your image contains a lot of inter-reflections, set max_trace_level to a low value such as 1 or 2. Don't forget to put it back up when you're finished!

Turn off any unnecessary lights. Comment out extended light keywords when not needed for debugging. Again, don't forget to put them back in before you retire for the night with a final render running!

If you've run into an error that is eluding you by visual examination it's time to start bracketing your file. Use the block comment characters /* ... */ to disable most of your scene and try to render again. If you no longer get an error the problem naturally lies somewhere within the disabled area. Slow and methodical testing like this will eventually get you to a point where you will either be able to spot the bug, or go quietly insane. Maybe both.

If you seem to have lost yourself or an object (a common experience for beginners) there are a few tricks that can sometimes help:

1) Move your camera way back to provide a long range view. This may not help with very small objects which tend to be less visible at a distance, but it's a nice trick to keep up your sleeve.
2) Try setting the ambient value to 1.0 if you suspect that the object may simply be hidden from the lights. This will make it self-illuminated and you'll be able to see it even with no lights in the scene.
3) Replace the object with a larger, more obvious "stand-in" object like a large sphere or box. Be sure that all the same transformations are applied to this new shape so that it ends up in the same spot.